

Rocky Flats Plant

1-15310-HSP-13.04

REVISION 0

BERYLLIUM PROTECTION

APPROVED BY: *[Signature]* 8/27/92 Responsible Organization: Industrial Hygiene
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Effective Date: September 27, 1992

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AFFECTS PLANT SAFETY PROCEDURE USE CATEGORY 3

The following PRRs/PCNs have been incorporated:
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Reviewed for Classification

By H. S. Hyatt-71-Date 8-15-92

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7.	REFERENCES
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1. PURPOSE


- 1.1 This practice defines the organizational responsibilities and requirements for working with and monitoring beryllium, a health hazard, on plantsite. These actions shall ensure that employee and visitor contact with airborne beryllium particles will occur at levels that are As Low As Reasonably Achievable (ALARA).

2. SCOPE

- 2.1 The standards of this practice apply to all employees and subcontractors who are involved in beryllium processing or who are associated with Beryllium and Beryllium Support operations.
- 2.2 This revision is a total rewrite and revision bars are omitted.

3. DEFINITIONS

- 3.1 **Beryllium**. It is a light, strong, non-radioactive metal possessing toxic properties. Any metal or compound with a beryllium content greater than 0.1% beryllium.
- 3.2 **Beryllium Action Level**. The Rocky Flats Plant (RFP) action level for beryllium is 0.5 micrograms per cubic meter ($\mu\text{g}/\text{m}^3$) over an 8-hour period collected by breathing zone air sample techniques.
- 3.3 **Beryllium Area Sample**. Beryllium area samples (also called airhead samples) at RFP are samples collected by placing a Whatman 41 filter on a stationary vacuum source near a process which has potential for producing beryllium particles.



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- 3.4 **Beryllium Breathing Zone Air Sample (BZAS).** Beryllium BZAS are samples collected by placing a filter in the worker's breathing zone. This is accomplished by placing a filter cassette on the lapel, connected to a length of hose, which is connected to a vacuum pump.
- 3.5 **Beryllium Operations.** Any operation involving the use of a compound greater than 0.1% beryllium where there is some potential for airborne beryllium concentration to exceed $0.5 \mu\text{g}/\text{m}^3$.
- 3.6 **Beryllium Smear Control Level.** The RFP beryllium smear control level is 25 micrograms per square foot ($\mu\text{g}/\text{ft}^2$). This sample is not directly related to health, but is instead an evaluation of cleanliness.
- 3.7 **Beryllium Smear Sample.** At RFP a beryllium smear sample (also called swipe sample) is a sample collected by smearing a dry Whatman 41 filter paper across a square foot surface area. Results are given in $\mu\text{g}/\text{ft}^2$.
- 3.8 **Beryllium Support Operations.** Those areas handling beryllium where there is little risk of contact with airborne beryllium particles, but which are monitored routinely by Industrial Hygiene.
- 3.9 **Beryllium Support Worker.** A beryllium support worker is a worker who has little risk of contact with airborne beryllium particles, but who does come in contact with beryllium in a manner that requires Industrial Hygiene oversight.
- 3.10 **Beryllium Worker.** A beryllium worker is a worker who has a high or moderate risk of contact with beryllium particles. The workers meet the following criteria:

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- (1) Any worker whose 8-hour breathing zone sample results reflect the presence of airborne beryllium particles in excess of 0.5 $\mu\text{g}/\text{m}^3$.
 - (2) Any worker who works in an occupation where breathing zone samples for airborne beryllium particles have the potential to exceed 0.5 $\mu\text{g}/\text{m}^3$.

NOTE

Industrial Hygiene is responsible for obtaining the samples upon which these determinations are made (see 4.1).

- 3.10.1 Beryllium workers at the Rocky Flats Plant (RFP) may include, but are not limited to personnel who work in the following operations involving beryllium compounds:

- (1) dry machining
- (2) dry milling
- (3) dry cutting
- (4) refining
- (5) powder metallurgy
- (6) handling beryllium chips
- (7) vapor coating

- 3.11 **Occupational Safety and Health Administration's (OSHA) Beryllium Permissible Exposure Limit (PEL).** OSHA's PEL for beryllium has three elements limiting airborne beryllium particles in the breathing zone to:

- (1) Two (2) micrograms per cubic meter ($\mu\text{g}/\text{m}^3$) for any 8-hour workshift of a 40-hour work week.

- (2) Five (5) $\mu\text{g}/\text{m}^3$ as an acceptable ceiling concentration except for the time period and concentration defined on the acceptable maximum peak (see item 3).
- (3) Twenty-five (25) $\mu\text{g}/\text{m}^3$ as an acceptable maximum peak above the acceptable ceiling concentration for a maximum of 30 minutes.

4. RESPONSIBILITIES

4.1 Industrial Hygiene Manager

- 4.1.1 Organizes and specifies controls pertaining to employee contact with airborne beryllium particles. This responsibility is carried out by way of the following actions:
 - (1) Identifying operations that require sampling, the location in which to collect samples and the necessary sampling frequency.
 - (2) Collecting representative beryllium BZASs.
 - (3) Reviewing sampling results for all beryllium areas, breathing zone, and smear samples.
 - (4) Specifying the type and quality of analysis required for all samples.
 - (5) Reporting results of surveys, samples, and beryllium operation observations to management and employees.
 - (6) Maintaining all beryllium sample records.
 - (7) Requiring a procedure or Integrated Work Control Program (IWCP) package for all beryllium work prior to initiation of the work.
 - (8) Identifying beryllium workers in conjunction with the Occupational Health department, and supervision; therefore requiring medical surveillance.
 - (9) Identifying operations that work with beryllium.

- (10) Reviewing the controls established to ensure the ALARA goals for beryllium are met.
- (11) Providing PBT technical guidance on the development and update of the Beryllium Operations Computer Based Training Program.

4.2 Occupational Health Director

- 4.2.1 Monitors employee health, based on the latest information available.
- 4.2.2 Assists Industrial Hygiene in identifying workers who need to receive medical surveillance for beryllium.

4.3 Radiological Health (RH) Analytical Laboratories Manager

- 4.3.1 Provides precise, accurate, and timely analysis of beryllium airhead and smear samples. Airhead sample results greater than 0.5 $\mu\text{g}/\text{m}^3$ will be transmitted to Industrial Hygiene on a priority basis, along with smear sample results greater than 25 $\mu\text{g}/\text{ft}^2$.

4.4 Radiological Operations Manager

- 4.4.1 Assigns an RPT to conduct the following activities:
 - (1) Collect all stationary area air samples and beryllium smear samples.
 - (2) Calibrates all stationary beryllium area air samplers on a routine basis.
 - (3) Performs routine ventilation evaluation in beryllium areas.

(4) Analyzes beryllium smear samples on the Beryllium Activated Swipe Test (BeAST).

(5) Calibrates the BeAST.

4.5 Engineering Manager

4.5.1 Designs and modifies the facilities and equipment used in the handling of beryllium.

4.5.2 Any operations involving beryllium on plantsite identified through the engineering review process requires Industrial Hygiene notification.

4.6 Air Quality Division (AQD) Manager

4.6.1 Collects stack samples and maintains all beryllium stack sampling equipment.

4.7 Operations Managers

4.7.1 Ensures the proper functioning of all ventilation systems that control beryllium aerosols in their area of responsibility.

4.8 Filter Systems Manager

4.8.1 Diocetyl Phthalate (DOP) leak tests and changes of the High Efficiency Particulate Air (HEPA) filters on ventilation systems plantwide.

- 4.8.2 DOP leak tests the HEPA filters and changes out the filters on the vacuum cleaners used within Beryllium Control Areas on a yearly basis or according to manufacturer's recommendations, whichever is the more stringent.

4.9 Supervisors

- 4.9.1 Assures that employees are aware of the hazards associated with beryllium and the appropriate controls for their work activity.
- 4.9.2 Assures that work activities are in compliance with this practice and HSP 13.03, "Carcinogen Control."
- 4.9.3 Assures that visitors to the work area conform to the entry requirements and safety rules for the area.
- 4.9.4 Assists Industrial Hygiene in the identification of beryllium workers who need to receive beryllium medical surveillance.
- 4.9.5 Assures that employees successfully complete the Beryllium Operations Course every two years.
- 4.9.6 Assures that employees are properly trained before performing beryllium operations.
- 4.9.7 Provide employees with the necessary personal protective equipment (PPE) to conduct the work activities.

4.10 Individuals

- 4.10.1 Follow all posted entry requirements, safety rules, procedures, and work control guidelines for the area.

4.11 Performance-Based Training (PBT) Manager

- 4.11.1 Develops and maintains a Beryllium Operations Computer Based Training Program and update the program under Industrial Hygiene's direction.

4.12 Procurement Manager

- 4.12.1 Assures that Industrial Hygiene has reviewed and signed all purchase requisitions, prior to placing the order for beryllium.
- 4.12.2 Notifies vendors that all shipments of hazardous materials shall be properly classified, described, marked, and labeled and accompanied by proper paperwork as specified in Title 49 CFR Regulations.

5. INSTRUCTIONS**5.1 Air Contamination Requirements**

- 5.1.1 Beryllium particulate air contamination in the workers' breathing zone shall be kept below the action level, 0.5 $\mu\text{g}/\text{m}^3$ over an 8-hour period by utilizing engineering controls, unless that worker is wearing an approved respirator.
- 5.1.2 The requirements of OSHA's Beryllium PEL shall be met.

5.2 Surface Contamination and Decontamination Requirements

5.2.1 Surface Contamination

- 5.2.1.1 Beryllium smear samples, a means of quantifying surface cleanliness, shall be used to verify that surface contamination levels are kept below 25 micrograms per square foot ($\mu\text{g}/\text{ft}^2$) in all areas accessible to workers. For example, this requirement includes walkways, but not the inside of gloveboxes or ductwork.

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5.2.2 Decontamination

- 5.2.2.1 Areas identified for cleaning shall be cleaned until a smear sample indicates the area cleaned has less than the beryllium smear control level of 25 $\mu\text{g}/\text{ft}^2$.
- 5.2.2.2 The method of cleaning and the frequency in which cleaning should be conducted, shall be documented in the operating procedure for the area.

5.3 ALARA Policy Requirements

The implementation of an ALARA policy for beryllium shall be achieved by keeping beryllium air and surface contamination lower than required limits.

5.3.1 Beryllium Air Contamination ALARA Goal

- 5.3.1.1 Implementation of the beryllium air contamination ALARA goal shall be accomplished by utilizing engineering controls to maintain airborne beryllium levels below the action level of 0.5 $\mu\text{g}/\text{m}^3$.

5.3.2 Beryllium Surface Contamination ALARA Goal

- 5.3.2.1 The implementation of the beryllium surface contamination ALARA goal shall be accomplished by routinely cleaning the surfaces involved in all beryllium operations and support operation areas, and by conducting routine decontamination work in some high use areas. This is verified by conducting beryllium smear sample surveys.

5.4 Work Control Requirements**5.4.1 Conduct and Controls**

- 5.4.1.1 All operations involving beryllium that has the potential for producing airborne beryllium particles shall:
- (1) Utilize engineering controls to minimize the potential hazards.
 - (2) Be conducted in a beryllium control area.
 - (3) Be performed using an approved procedure, OSA, JSA or IWCP.

5.4.2 Prohibited Items/Activities

5.4.2.1 The following are prohibited in beryllium operation control areas:

- (1) Eating
- (2) Drinking
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- (3) Chewing gum
- (4) Brushes
- (5) Use of compressed air for cleaning.
- (6) Use of abrasives such as abrasive cleaning pad, sandpaper without being specifically approved by Industrial Hygiene.
- (7) Use of non-HEPA filtered vacuums.

5.4.3 Beryllium Area Entry Requirements

5.4.3.1 Worker Controls

All personnel who work in a beryllium control area shall be:

- (1) Qualified to work at that job by Occupational Health.
- (2) Trained in the hazards associated with and the measures used to protect against inhalation of beryllium.
- (3) Qualified to wear a respirator.

5.4.3.2 Visitor Control

All visitors to beryllium control areas shall be:

- (1) Informed/trained in the hazards associated with and the measures used to protect against inhalation of beryllium.
- (2) Qualified to wear a respirator if that is an entry requirement at the time of the visit.

5.4.4 **Enforcement**

- 5.4.4.1 The Operations Manager or designee over the beryllium control area shall post the entry requirements.

5.4.5 **Beryllium OSAs/Approved Procedures**

- 5.4.5.1 All routine beryllium operations that have the potential to generate beryllium dust shall have workplace controls identified by an OSA or approved procedures.
- 5.4.5.2 Beryllium operation OSAs or approved procedures shall identify the Carcinogen Program requirements, compliance methods, and the routine decontamination frequencies for that operation.

5.4.6 **IWCPs/JSAs**

- 5.4.6.1 An IWCP/JSA shall be required for all non-routine work involving beryllium with the potential for producing airborne beryllium particles. Industrial Hygiene shall approve these documents prior to issuance.

5.5 Protective Clothing Requirements

5.5.1 Workers

- 5.5.1.1 Within a beryllium control area, workers shall wear blue coveralls over company issued modesty clothing and blue booties or blue toed shoes.

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- 5.5.1.2 Upon leaving a beryllium control area, workers are required to remove the blue issues and shower when leaving the area for the day.

5.5.2 Visitors

- 5.5.2.1 Within a beryllium control area, visitors shall wear light blue coveralls or disposable coveralls, over personal clothing and blue booties.

- 5.5.2.2 Upon leaving a beryllium control area, the visitors are required to remove the visitor coveralls and booties.

5.6 Routine Beryllium Air and Surface Monitoring Requirements

5.6.1 Monitoring

- 5.6.1.1 Industrial Hygiene shall establish and maintain schedules for air and surface monitoring.

5.6.2 Sample Results

- 5.6.2.1 Supervisor of the affected area shall be immediately notified whenever a sample result exceeds the action level.

5.6.2.2 Breathing zone air sample results shall be disseminated to affected individuals within 5 days after receipt of results.

5.6.2.3 All sample results shall be made available to employees upon request.

5.6.3 Non-conformance Events

5.6.3.1 All samples that exceed limits for air or surface contamination are defined as nonconformance events.

5.6.3.2 Industrial Hygiene and management of the applicable user group shall define what will be done to correct the situation.

5.6.3.3 Industrial Hygiene and the user group shall verify that the nonconformance event has been addressed.

5.7 Inspections Requirements

5.7.1 General

5.7.1.1 IH shall conduct periodic inspections of beryllium operations and beryllium support operations.

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5.7.2 Ventilation

5.7.2.1 Routine ventilation evaluations in beryllium areas will be conducted by the Radiation Protection Technicians (RPTs).

- 5.7.2.2 Local exhaust systems that do not meet the ventilation requirements shall be posted with a ventilation red label in accordance with HSP 2.14, and the manager of the area, Operations Manager, and Industrial Hygiene shall be notified to take corrective actions.

5.7.3 Employee and Management Concerns

- 5.7.3.1 Industrial Hygiene, Occupational Health, Radiological Operations, Engineering, AQD, Utilities, and/or Filter Systems shall inspect beryllium areas as necessary, to address employee and management concerns within that area.

5.8 Training Requirements

5.8.1 Workers

- 5.8.1.1 Beryllium workers and beryllium support workers shall receive Beryllium Operations Training once every two years on the hazards associated with beryllium and the means by which these hazards are controlled.

5.8.2 Visitors

- 5.8.2.1 Unescorted visitors to beryllium control areas shall have had Beryllium Operations Training within the past two years.
- 5.8.2.2 However, visitors escorted by an individual knowledgeable of the area, and who has received the Beryllium Operations Training, do not need to receive the training.

5.9 Requirements for Vacuums Used for Beryllium

5.9.1 All vacuums used in beryllium control areas shall meet the following criteria:

- (1) Approval by Industrial Hygiene.
- (2) HEPA filtration on the exhaust.
- (3) Annual leak testing by Filter Systems.

5.10 Personal Protective Equipment (PPE) Requirements

5.10.1 Industrial Hygiene shall specify respirator protection for beryllium and the need for beryllium clothing (e.g., blue coveralls, blue booties/blue-toed shoes). Use of PPE shall be specified in the OSA.

5.11 Requirements for Medical Evaluation

5.11.1 All beryllium workers shall receive medical surveillance.

5.12 Carcinogen Control Requirements

5.12.1 Beryllium operations shall comply with requirements of HSP 13.03, "Carcinogen Control."

6. RECORDS

6.1 Maintain all records relating to the Beryllium Control Program in accordance with the Records Management Manual.

7. REFERENCES

- 7.1 ACGIH, Industrial Ventilation (latest edition)
- 7.2 ACGIH, Threshold Limit Values (latest edition)
- 7.3 AIHA-ACGIH, Respiratory Protective Devices Manual (latest edition)
- 7.4 ANSI Z9.2, Fundamentals Governing the Design and Operation of Local Exhaust Systems (latest edition)
- 7.5 ANSI Z88.2, American National Standard Practices for Respiratory Protection (latest edition)
- 7.6 DOE F3-43, Quality Assurance of HEPA Filters
- 7.7 DOE Order 5480.1, Environmental Protection, Safety and Health Protection Standards
- 7.8 ERDA LA6370M, Division of Safety, Standards, and Compliance Respirator Manual
- 7.9 HSP 2.03, Operational Safety Analysis (OSA)
- 7.10 HSP 2.11, Job Safety Analysis
- 7.11 HSP 2.14, Ventilation for the Control of Occupational Hazards
- 7.12 HSP 4.09, Physical Examinations
- 7.13 HSP 7.03, Respiratory Protection
- 7.14 HSP 7.05, Breathing Air
- 7.15 HSP 13.03, Carcinogen Control
- 7.16 4-15310-IHPM-5.2, Beryllium Control Program
- 7.17 Integrated Work Control Program (IWCP)
- 7.18 4-74UOP-FTF-002 Inplace DOP High Efficiency Particulate Filter Testing
- 7.19 M-0406, Medical Surveillance Program

- 7.20 NIOSH-HETA 84-510-1691, Review of Rocky Flats Beryllium Operations
- 7.21 NIOSH-HSM72-10268, Criteria for a Recommended Standard; Occupational Exposure to Beryllium
- 7.22 NIOSH, NIOSH-Certified Personal Protective Equipment (latest edition)
- 7.23 Onsite Transportation of Radioactive and Other Hazardous Materials Manual, Hazardous Materials Other Than Radioactive
- 7.24 OSHA 29 CFR: 1910.134, Respiratory Protection (latest edition)
- 7.25 OSHA 29 CFR: 1910.1000, Table Z-2 Permissible Exposure Level (latest edition)
- 7.26 OSHA 49 CFR, Transportation (latest edition)
- 7.27 Plant Policy 4.5, Control of Employee and Environmental Exposures to As Low As Reasonably Achievable
- 7.28 Production Operations Manual POG-4, Beryllium Operations
- 7.29 Records Management Manual
- 7.30 RES-FTF-001A Pre-Installation DOP Filter Testing
- 7.31 Rocky Flats H&S Quality Program Plan, Respiratory Protection Plan
- 7.32 Rocky Flats H&S Quality Program Plan, Industrial Hygiene Health, Safety and Environment
- 7.33 Rocky Flats Material Packaging Shipping, and Transportation Plan, Hazardous Material, Classified Nonhazardous Material
- 7.34 Rocky Flats OSA 444.019, Beryllium Fines Handling
- 7.35 Rocky Flats Operational Safety Operations Procedure: 444.18, Production Analysis Machining of Beryllium
- 7.36 Rocky Flats Report No. HS-141(210), Section 1.3, Industrial Hygiene Procedures Beryllium Air Sampling
- 7.37 Rocky Flats Report No. HS-141(210), Section 1.4, Industrial Hygiene Procedures, Beryllium Smear Survey

For additional information on this practice, contact L. A. Issaian, Industrial Hygiene, Extension 2406.